ATTACHMENT 2

Understanding Grazing Land and Water Quality

Grazing management principles must be applied in combination to accomplish multiple goals including profitability assurance, maintaining forage vigor, and addressing water quality issues. Stocking rate, grazing distribution, degree of use, season of use, and kind and class of livestock are the primary principles used to produce a management strategy. Well devised facilities and/or practices such as livestock water, prescribed burning, and fencing are fundamental to a successful strategy. When strategy or practice changes are considered, their impact on vegetative cover and livestock concentration should be evaluated. An effective evaluation identifies the expected livestock behavioral response to the new combination of management principles, pasture facilities and landscape features. Significant management changes or investments to protect water quality will be selected based not only on expected livestock behavior, but also on economic feasibility.

Implementation of water quality protection strategies in Kansas is currently voluntary. Livestock producers promote profitability by basing their decisions on cattle prices, interest rates, conservation incentive, and other external factors such as lease agreements. Widespread adoption of water quality protection strategies will ultimately depend on the projected economic impact. Livestock prices, input costs, interest rates, and risk influence the amount of investment in water quality protection the grazing enterprise can support. Frequently, water quality protection practices require a large initial investment which is not economically feasible unless conservation incentives are available. Conversely, negligible investment is required for some practices which can simultaneously improve forage utilization and water quality, such as moving supplements away from water resources.

Protecting water quality requires a long term commitment from the grazing land manager. Land tenure may influence water quality when lease agreements encourage short-term, non-sustainable use of grazing land resources. Annual rental agreements, in particular, may promote over-grazing, decreasing vegetative potential to limit runoff. A study conducted by project staff suggests annual leases promote a stocking rate up to 18% heavier than that of an owner operator. This study also suggests that leases greater than 4 to 8 years provide a stocking rate incentive similar to an owner-operator. Furthermore, tenants may be more willing to invest in capital improvements and other conservation strategies if they can maintain grazing rights long enough to realize the benefit. Lease contracts should explicitly specify strategies and/or practices as stocking rates, standards of brush and noxious weed control, and other factors that can impact water quality.

Integrating water quality protection into management objectives requires accurate and accessible management information and may require more intensive record keeping for the grazing resource manager. At the same time, improved record keeping helps to monitor costs and improve efficiency in the increasingly competitive livestock industry.

As indicated, addressing water quality through grazing management entails manipulating livestock behavior. Numerous factors individually, collectively, and simultaneously influence pasture use by livestock. The complexity of grassland systems challenge the use of generic grazing management recommendations to address water quality issues. As operators develop management strategies to protect/enhance water quality, each unique pasture will require a separate evaluation as part of a management unit and/or watershed solution.

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Grazing Land Water Quality

Water quality from grazing lands is impaired when suspended solids (soil particles, organic matter particles), nutrients (nitrogen, phosphorus), bacteria, and pesticides exceed standards for specific uses. Pollutants enter streams and rivers through surface flow (runoff) or through internal soil drainage (sub-surface flow) either as suspended material or dissolved in water. Internal soil drainage will carry both dissolved and suspended material. Surface flow also carries both suspended and dissolved materials and is the major pollution transport mechanism for Kansas grazing lands. Fecal coliform bacteria, which can originate from human, livestock or wildlife sources, frequently exceed water quality standards in Kansas. Though fecal bacteria is a major concern state-wide, an interpretation of the literature by the Kansas Department of Health and Environment suggests that fecal coliform concentrations in typical grazing land streams tend to be lower than those for other land uses. Although the source(s) of coliforms and other pollutants is often difficult to determine, the application of sound grazing management principles will help maintain concentrations at acceptable levels.

The quality of water leaving grazing lands is primarily a function of interrelationships between precipitation (interval, duration, and intensity), landscape characteristics, and livestock use. Precipitation events normally determine the maximum amount of runoff possible, while landscape characteristics dictate how much runoff, if any, will occur. Landscape characteristics influencing runoff include: topography (slope, aspect, terrain), soil characteristics (depth, texture, moisture capacity, etc.), and vegetative cover (species composition, basal density, canopy cover, mulch). Infiltration and vegetative cover reduce runoff and subsequent pollutant loading to water courses. Livestock may impact water quality through direct deposition of waste (manure/urine) in water resources or by effects associated with animal concentration (manure concentration, trampling, trailing), over-grazing, and/or un-timely de-vegetation (relative to precipitation events). Management can enhance water quality by manipulating vegetative cover (forage resources) and by managing livestock so that negative impacts associated with livestock use in a pasture are minimized.

Forage production for livestock consumption and for the replenishment of root reserves are primary factors in the efficient and economical operation of any grazing enterprise. Adjustments in management and/or facility location can be used to increase plant cover, production, and density. Management should strive to insure an adequate separation (distance and cover) between livestock waste (manure and urine) and drainages. In developing management strategies to improve vegetative cover, the grazing land manager is guided by the basic grazing management principles of stocking rate, grazing distribution, degree of use, season of use, and kind and class of livestock.

A review of relevant literature, pasture inventories, and communication with managers is providing an improved understanding of the interrelationship between livestock behavior and water quality. Water quality associated with grazing land is influenced by livestock distribution. Landscape characteristics that may influence livestock distribution include: livestock water (kind, location, quantity, quality), shade (presence or absence, location, canopy characteristics), topography, landscape temperature differentials, prevailing winds, and facility (feeders, rubs, fences, gates, etc.) locations. Relationships between landscape characteristics, pasture conditions, and facilities determine where livestock will likely graze and congregate and thus the location and relative degree of defoliation and waste deposition.

Water locations preferred by livestock strongly influence where livestock graze and congregate because thirst is a primary physiological demand. Loafing and social behavior tend to prolong livestock concentration around watering points. Loafing may be prompted by the need to rest, ruminate, and/or take advantage of evaporative cooling or shade. Social interactions that tend to be concentrated around watering points include pecking order establishment, suckling, and breeding.

Livestock preference between similar watering facilities in the same pasture is usually determined by prevailing wind direction, proximity to shade, location of salt/mineral supplements, feed, and/or other factors that satisfy physiological needs. Current research and experience suggests that, all other factors being equal, livestock prefer water facilities in the following order: 1) trough (from well or spring), 2) pond 3) pool in stream, and 4) flowing point on stream. In general, livestock seem to prefer watering from a trough and generally avoid watering from flowing points on streams. The cause of this behavior is unclear; temperature, taste, and fear may contribute to these preferences. Research suggests palatability and water temperature significantly influence water consumption. A variety of safety concerns may also exist in and/or near watering facilities. Ice, mud, or collapsing stream banks may cause injury or even death. It is also reasonable to assume that livestock may instinctively prefer watering at locations having good visibility to avoid predation.

Pasture inventories have identified problems associated with watering location, particularly pond siting. Water in the south part of a pasture is frequently associated with more extreme cases of livestock concentration and poor vegetative cover. Water sited in topography that limits livestock access tends to be used less resulting in over use of other water sources or reduced intake by livestock (reducing animal performance). Properly placed water facilities have the potential to enhance grazing distribution and allow safe and easy access to palatable water. Troughs, supplied by pipelines from wells or springs, can be strategically located to provide a water source in a desirable portion of the pasture and in topography that allows easy access by livestock. If ponds can be located similarly, they too may enhance water quality.

Past placement of watering facilities (typically ponds) was to a great degree limited by topography. Decisions regarding location and type of facility were also limited by the tradition, economics, technology, and public energy and/or water distribution infrastructure at the time of installation. Management decisions made today offer a different set of opportunities and limitations but are still driven by a basic understanding of natural systems, economic cycles, and technology. Water facility location is a major water quality concern due to the level of activity associated with preferred watering points, yet it is only one of several factors to be evaluated when addressing water quality concerns. Preferred shade and management facilities placed for convenience, such as feeding areas located in drainages, are examples of additional concentration areas of potential concern.